State of South Dakota

2019 Forest Health Highlights

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General Overview:

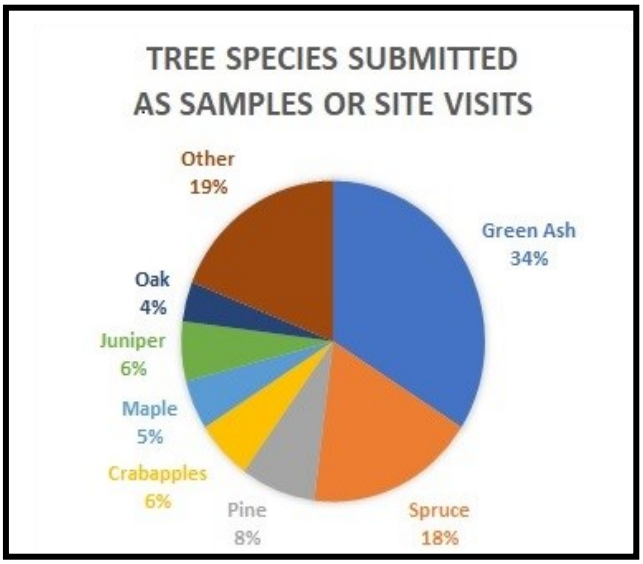
The most common tree species from which samples were submitted (either by mail or as pictures sent by email or text) or inspected during site visits was green ash (*Fraxinus pennsylvanica*) (34%). Green ash is one of the most common trees in South Dakota community forests and windbreaks. The discovery of emerald ash borer in Sioux Falls last year increased awareness and concern regarding the insect so more tree owners were looking for symptoms and signs of emerald ash borer infestations in their ash trees.

Most of these samples came from the Sioux Falls area, but samples came from throughout the state. The most common insect identified by site visits to these trees was either the banded or redheaded ash borer, followed by the clearwing ash borer and the ash bark beetle. No emerald ash borers were identified in any trees that tree owners or tree services thought were infested. Approximately 3% of the trees the public or tree company workers thought were infested by emerald ash borer in 2019 were not even ash. The most common tree mistaken for an ash was boxelder (*Acer negundo*), followed by Norway maple (*Acer platanoides*) and black walnut (*Juglans nigra*).

Spruce was the second most common genera submitted for diagnosis (18%). Most of these samples were from Colorado spruce (*Picea pungens*), followed by white spruce (*P. glauca*). Colorado spruce is common to communities and windbreaks throughout the state. White spruce, commonly referred to as Black Hills spruce, is also planted throughout the state and is native to the Black Hills. The most common pests diagnosed were cyptospora canker, spruce needlecast diseases, and spruce needleminer.

Pine - Austrian (*Pinus nigra*), ponderosa (*P. ponderosa*), and Scotch (*P. sylvestris*) - was the third most common genera for diagnosis (8%). Austrian and Scotch pine are common trees in windbreaks throughout the southern half of the state and are planted in communities through the state. Ponderosa pine is native to the Black Hills and adjacent regions to the north and east. It is also a common windbreak and community tree through the state. The most common pests associated with these trees was pine wilt disease on the Austrian and Scotch pines, and diplodia tip blight, dothistroma needle blight, and pine engraver beetle on ponderosa pines.

Other common tree genera submitted as samples were crabapple (*Malus*) (6%), maple (*Acer*) (5%), juniper (*Juniperus*) (6%), and oak (*Quercus*) (4%). Other genera submitted as samples or seen in site visits include aspen and cottonwood (*Populus*), catalpa (*Catalpa*), hackberry (*Celtis*), honeylocust (*Gleditsia*), and walnut (*Juglans*).



Pie graph showing the percentage of trees submitted by species during FY2019

Confirmed Insects & Mites

By samples submitted or pictures sent via phone or email

- Apple maggot (*Rhagoletis pomonella*)
- Ash/lilac borer (*Podosesia syringae*)
- Ash bark beetle (*Hylesinus* spp)
- Ash grey blister beetle (*Epicauta fabricii*)
- Ash plant bug (*Tropidosteptes amoenus*)
- Ash seed weevils (*Lignyodes bischoffi*)
- Banded elm bark beetle (*Scolytus chevyrewi*)
- Banded ash borer (*Neoclytus caprea*)
- Basswood leaf miner (*Baliosus nervosus*)
- Boxelder bug (*Boisea trivittata*)
- Bronze birch borer (*Agrilus anxius*)
- Carpenterworm (*Prionoxystus robiniae*)
- Codling moth (*Cydia pomonella*)
- Cotoneaster leaf crumpler (*Acrobasis indigenella)*
- Cottonwood borer (*Plectrodera scalator*)
- Cottonwood leaf beetle (*Chrysomela scripta*)
- Dogwood sawfly (*Macremphytus tarsatus*)
- Eastern tent caterpillar (*Malacosoma americanum*), the western tent caterpillar (*M. californicum*) and the forest tent caterpillar (*M. disstria*)
- Elm sawfly (*Cimbex americana*)
- Emerald ash borer (*Agrilus planipennis*)
- Fall webworm (*Hyphantria cunea)*
- Fall cankerworm (*Alsophila pometaria)*
- Flatheaded appletree borer (*Chrysobothris femorata*)
- Fruittree leaf roller (*Archips argyospila*)
- Gall wasp (*Callirhytis flavipes*)
- Hackberry nipple gall maker (*Pachypsylla celtidismamma*)
- Honeylocust pod midge (*Dasineura gleditschiae*)
- Imported currantworm (*Nematus ribesii*)
- Io moth (*Automeris io*)
- Japanese beetle (*Popillia japonica*)
- Lecanium soft scales (*Parthenolecanium*)
- Maple bladder gall mite (*Vasates quadripedes*)
- Metallic woodborer (*Buprestis confluenta*)
- Pear slug (*Caliroa cerasi*)
- Pine engraver beetle (*Ips pini*) *
- Pine leaf adelgid (*Pineus pinifoliae*)
- Plum curculio (*Conotrachelus nenuphar*)
- Poplar borer (*Sapera calcarata*)
- Poplar vagabond aphid (*Mordvilkoja vagabunda*)
- Spotted wing drosophila (*Drosophila suzukii*)
- Spruce bud scale (*Physokermes piceae*)
- Spruce needleminer (*Endothenia albolineana*)
- Turpentine beetle (*Dendroctonus valens*)
- Twolined chestnut borer (*Agrilus bilneatus*)
- Velvet erineum gall mite (*Aceria aceris*)
- Willow sawfly (*Nematus ventralis*)
- Zimmerman pine moth (*Dioryctria* spp)

*Although calls were responded to regarding mountain pine beetle (Dendroctonus ponderosae), this insect was nearly undetectable this year. Calls were typically pine engraver or turpentine beetles.

Bronze birch borer larvae
(Dr. John Ball Pest Update, November 14, 2018 Volume 16, # 37)

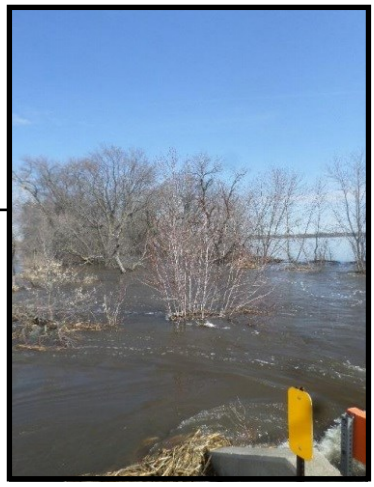
Confirmed Diseases

By samples submitted or pictures sent via phone or email

- Apple scab (*Venturia inaequalis*)
- Ash anthracnose (*Plagiostoma fraxini*)
- Ash rust (*Puccinia sparganioides*)
- Bacterial blight of lilac (*Pseudomonas syringae* pv. *syringae*)
- Black knot (*Apiosporina morbosa*)
- Bur oak blight (*Tubakia iowensisi*)
- Cedar-apple rust (*Gymnosporangium juniperivirginianae*), cedar-hawthorn rust (*G. globosum*), and cedar-quince rust (*G. clavipes*)
- Cereal rust fungus (*Puccinia coronata*)
- Diplodia tip blight **(***Diplodia pinea*)
- Dothistroma needle blight (*Dothistroma pini*)
- Dutch elm disease (*Ophiostoma novo-ulmi*)
- Fireblight (*Erwinia amylovora*)
- Guignardia blotch (*Guignardia aesculi*)
- Juniper broom rust (*Gymnosporangium nidus-avis*).
- Kabatina twig blight (*Kabatina juniperi)*
- Marssonina blight (*Marssonina brunnea*)
- Phomopsis twig blight (*Phomopsis juniperovora*)
- Plum pockets (*Taphrina communis*)
- Tar spot (*Rhytisma acerinum*)
- Spruce needlecast (*Stigmina lautii* and *Rhizosphaera kalkhoffii*)
- Sycamore anthracnose (*Apiognomonia veneta*)
- Valsa (cytospora) canker (*Valsa kunzei*)
- Walnut anthracnose (*Ophignomonia leptostyla*)
- Willow scab (*Venturia saliciperda*)
- Verticillium wilt (*Verticillium dahliae*)

Sample Photos Submitted, with Follow-Up Site Visits

- Chlorosis (*Acer rubrum*, *Betula nigra,* and *Quercus palustris*)
- Flooding/saturated soils (*Picea*)
- Winter- burn (*Abies*, *Taxus* and *Thuja*)



Flooded trees
(Dr. John Ball Pest Update, March 27, 2019, Volume 17 #7)

Woody Plant Identification

- Common buckthorn (*Rhamnus cathartica*)
- Green ash (*Fraxinus pennsylvanica*)
- Tatarian honeysuckle (*Lonicera tatarica*)
- White mulberry (*Morus alba*)

Highlighted Insect Conditions: Borers

Emerald ash borer was confirmed in northern Sioux Falls in May 2018. This was the first discovery of this insect in South Dakota and was about 100 miles from the closest confirmed reports in Alta, Iowa and Welcome, Minnesota.

The infestation appeared to be about two to three years old at the time though a few trees showed about four years of repeated attacks (based on our dendrochronology study). The infestation appeared confined to a relatively small area of city. Approximately 250 infested trees were identified by initial delimiting survey by crews from the South Dakota Department of Agriculture. Only another 53 trees have been identified in 2019 but survey work in on-going.

The Master Gardeners, with assistance by the South Dakota Department of Agriculture, began a survey of the street tree population in Sioux Falls. The inventory collected information on tree location, species, height, diameter and general condition. The Master Gardeners collected information on more than 5,200 street trees. The data they collected showed that about 36% of the street trees are ash (e.g. black, green, white), 31% maple (e.g. Norway, red, silver, or sugar), 5% lindens (e.g. American or littleleaf), 5% hackberry, and 3% honeylocust. The remainder are other genera (e.g. elms, oaks) or unknowns. This means that a significant proportion of the street tree population is at risk to a known lethal threat (ash- emerald ash borer) or to a possible threat (maple – Asian longhorned beetle).

Infested ash tree with 20% canopy decline (Dr. John Ball Pest Update, July 3, 2019, Volume 17 #20)

Roughly 8,000 street and residential ash trees were treated via trunk injection during 2018, with an additional 2,000 trees treated in 2019, Almost all the ash within the core area where the infestation was first found were treated in either 2018 or 2019. This action will greatly slow the spread and expansion of the infestation beyond the core if these treatments continue. Many of these treated infested trees were presenting 20 to 30% canopy decline by mid-summer. This is generally considered the limits for successfully injecting trees and having a recovery. There were a few trees that were presenting 40 to 50% canopy decline. The vascular disruption from the galleries may prevent an even uptake and distribution of the insecticide. However, all these treated trees were still alive in September (2019).

The city has already started their removal of ash trees along streets and in parks. They are working in the southern half of the community rather than on the boundary of the infestation. This strategy can slow the spread by using the buffer to absorb the migrating beetle population, as the emerald ash borer does not fly far if there are available hosts nearby. Ash pruning and removal were prohibited within the city of Sioux Falls during the adult flight period (Memorial Day to Labor Day), except for public safety and line-clearance.

Another tactic to slow tree mortality is the introduction of natural enemies, insects that feed on emerald ash borer. While the introduction of these insects will not eliminate the threat, nor are they a replacement for removal or treatment of infested trees, they can help to slow the spread. These insects, known as parasitoid wasps, were released on trees infested by emerald ash borer but are not being treated with insecticides. Some of these wasps, *Tetrastichus*, were released by attaching small logs containing the insects onto trees. Another larval wasp, *Spathius*, was released by cups attached to the tree. The egg wasp, *Oobius*, was released by shaking them out of small cup. The releases were made by APHIS beginning in mid-summer and continued over a five-week period utilizing the same trees. At least one of these trees will be felled this coming winter and larvae examined for parasitism.

Highlighted Insect Conditions: Borers

Velvet longhorned beetle (Trichoferus campestris) is a wood boring insect from East Asia, native to China Korea and Russia. It was first detected in North America in Quebec (2002) and since then in 14 states including Colorado (2013) and Minnesota (2010). The insect is typically detected in traps and in warehouses, not trees, but it is established in fruit orchards in Utah. An adult velvet longhorned beetle was captured in August 2019 from a trap in Brookings, SD. This followed adults collected from a new table made from air-dried walnut last year. The tree was harvested from Vermillion SD. The larval stage of the insect can continue developing in raw timber and even dry wood. The preferred living host is apple/crabapple and peaches (*Prunus*). But it has been found in birch (*Betula*), honeylocust (*Gleditsia*), mulberry, pine, spruce, walnut, and willow (*Salix*). Infested trees usually present with declining canopies and epicormic shoots. There will also be pencil size oval holes on the trunk and frass at the base of the tree. Finding these symptoms does not positively identify the tree as infested by the velvet longhorned beetle as tree infestations by our native longhorned beetle will present the similar symptoms. This insect has the potential to be a significant pest in apple and peach orchards. It also can become a structural problem in rustic furniture, any wood product with some bark retained on the edge. The insect has been known to live 18 months in furniture before emerging.

Ash/lilac borer (*Podosesia syringae*) is a common borer of stressed ash trees and there has been an increase in reports of this insect following the confirmation of emerald ash borer in the state and the drought that left many trees vulnerable to attack.

Bronze birch borer (*Agrilus anxius*) is a native insect that attacks birch. It is a close relative to the emerald ash borer so they both make ac D-shaped hole as the adult emerges from the tree. Bronze birch borers colonize almost every birch species with the most susceptible being Asian and European species such as the European white birch (*Betula pendula*). The Prairie Vision Asian white birch (*Betula platyphylla* 'Verdale') which was released by North Dakota State University as borer resistant is not and we have lost many of this cultivar to the borer. The river birch is very, very rarely attacked by bronze birch borer and can be considered a borer-free alternative to other species.

Locust borer (*Megacyllene robiniae*) is a common insect associated with declining black locust. Adults are very colorful and distinctive with a large yellow 'W' on the wing covers and yellow bands on the thorax of any otherwise black insect. The adults fly in late summer and can be found searching for egg-laying sites on the locust or feeding on flowers in the garden. The legless larva, found from late autumn to the following mid-summer, is about one inch long at maturity and is typically cream colored with a brown head. The black locust is the only host for this insect. It does not infest any other species of *Robina*.

Highlighted Insect Conditions: Galls

Gall wasp *Callirhytis flavipes*. The galls formed by this gall wasp are not particularly harmful to the tree, no more than the many other galls that form on oaks. What makes this gall wasp a problem is the woodpeckers that feed on the larvae during the winter. The woodpeckers can shred most of the bark from young trees, enough that the trees are be killed by this injury. The trees that are not killed by the woodpecker activity, often have the tops killed back enough that the trees become misshaped and of little value as a windbreak tree.

During the winter these small, white larvae are found within the inner bark of the branches and twigs of mature oak trees and the trunks of young trees. The gall wasps emerge in the spring as adults and move to the newly expanded leaves where *they insert eggs into the midrib, the central vein of the leaf. Once the eggs hatch, the larvae form a gall on the vein and live out their short lives within this structure. Adults emerge later in the season and lay eggs on the twigs and branches.*

Highlighted Insect Conditions: Defoliators

Basswood leaf miner (*Baliosus nervosus*). While basswood (*Tilia americana*) is the common host in the eastern US, this same insect frequently attacks white oaks including bur oak. South Dakota does not have native basswood trees west of Hwy 81 but there are extensive oak stands lacing the many creeks and rivers in western South Dakota and these are suitable hosts. Female adults lay eggs in June after the leaves fully expand and once hatched the larva burrow into the leaf to feed for the summer leaving brown blotches on the leaves. The adults emerge in August and continue injuring the leaves by feeding on the upper surfaces of the foliage. The adults are dark reddish yellow and have wedge shaped wing covers with ridges running the length of them. They can be found in clusters on the leaves right during late summer. When disturbed they will either drop to the ground or fly off.

The defoliation on the oaks in these draws is near 100% on some trees along Little White River between White River and Hwy 18 and rarely less than 40%. The trees have already set buds for next year and appear to be otherwise healthy. While an individual tree can be treated with an insecticide to reduce the defoliation, this is impractical for the oak draws in this area. A light surface control burn in early spring can kill the adults that are overwintering in the leaf litter, but this is also impractical for these draws.

Dogwood sawfly (*Macremphytus tarsatus*) resulted in defoliation of redosier dogwoods (*Cornus sericea*) in the eastern half of the state. Many dogwood shrub beds were completely defoliated by early September. This is the second year for significant defoliation of dogwoods by this insect. There are two generation per year with the second generation (appearing in August) causing the most defoliation.

Dogwood sawfly larvae (Dr. John Ball Pest Update, September 4, 2019, Volume 17 #30)

Japanese beetle (*Popillia japonica*) adults were out feeding in communities across South Dakota. The Asian insect was first found in New Jersey in 1916 and spread all the way to South Dakota by 2007. It is now found in scattered communities across the state. It is also present in North Dakota, Minnesota, and Nebraska.

The Japanese beetle larva is a C-shaped grub that feeds on grass roots though they have been found feeding on the roots of container nursery stock. During hot, dry summers, the severing of turf roots can add to the water stress and large dead patches of turf can develop in grub infested soil. Skunks, moles and shrews find the grubs tasty so heavily infested lawns will also be torn up at this time of year as these animals search for the insects. While the larvae are a concern to anyone that likes turf, the adults can defoliate trees and shrubs. The defoliation is not complete, instead the adults feed on the soft tissue between the veins leaving a lace-like appearance to the foliage. Japanese beetle adults do not feed indiscriminatingly but prefer certain hosts. The trees that are their favorites include American elm (*Ulmus americana*), buckeye (*Aesculus*), linden, apple and crabapples, birch, cherry and plum (*Prunus*), Norway maple and walnut. The two shrubs most often defoliated are hydrangea (*Hydrangea*) and rose (*Rosa*).

The most common treatments for the adults are foliar sprays of insecticides labelled for control of Japanese beetles and containing acephate, carbaryl or imidacloprid as the active ingredient. A soil drench of an insecticide containing imidacloprid may also be used but should be applied in the spring before adults are found feeding on the leaves. Imidacloprid cannot be used as a soil drench on *Tilia* because of the concern with pollinators.

Highlighted Insect Conditions: Defoliators

Imported currantworm (*Nematus ribesii*) was defoliating alpine currant (*Ribes alpinium*) in 2019. The sawfly larvae feed long the interior of the shrub but eventually all the leaves on a plant may be eaten. The sawfly larvae become a light green gray with lots of black spots along the abdomen, but they are more a uniform light green just after a molt. The insect overwinters in a cocoon in the soil with the adult wasp emerging in mid-spring. The eggs are laid on the middle vein in the leaves and hatch in about a week. The larvae feed in colonies along the leaves for about three weeks.

The full-grown larvae (3/4-inch) drop to the ground to form a cocoon. Some remain in a cocoon until the following spring but others (as these did) emerge as adults the same summer and form a second generation. The treatment is usually carbaryl (Sevin) or Malathion applied when the larvae are present. Irritants, such as soaps and even dishwashing detergents, can kill young larva.

Io moth (*Automeris io*) caterpillars were collected from a chokecherry in Harding County, the western edge of its distribution in North America. The caterpillars have sharp venomous spines that line their back look pretty but don't touch! If you brush your hand across the back of one of these caterpillars, it will cause a prickling sensation, like brushing against stinging nettle.

The Io moth overwinters in a cocoon with the large adult moths emerging in early summer. The eggs are laid on the shoots and leaves of many different tree species including cherries, hackberry, oaks, and willows. Once the eggs hatch, the larvae move out to the leaves to feed. They do not form a nest but may feed in groups that form long trains as they travel up the shoots. Eventually the larvae feed alone before dropping to the ground to pupae for the winter.

Oak lace bug (*Corythucha arcuata*) caused widespread leaf discoloration of bur oaks**.** Lace bugs, both the nymphs and adults, feed by sucking sap from the foliage leaving small stipples in the leaf surface that leaves almost a bronze appearance to the foliage. The lower surface of these discolored leaves will often be covered with small powered-like dust, the frass or excrement from the insects. By the time the insects are noticed, most of the damage is done and treatments are probably not warranted. We have two generations per year in South Dakota with adults out in July and September.

Pear slugs (*Caliroa cerasi*) defoliation was higher than average this year. The olive-green larvae are the damaging stage and feed on the leaves of pears (hence the name) as well as cherries and even an occasional plum or apple. The damage is usually not severe enough to warrant treatments.

There are two generation per year of this insect. The adults emerge in the spring from cocoons in the soil. The adults are a non-stinging wasp about 3/16-inch long. The adult female cuts slits in the edge of the leaves with her saw-like ovipositor with the eggs hatching within two weeks. The young larvae move out and feed on the upper surface of the leaves for about a month before dropping to the soil and forming cocoons. The second-generation adults emerge in early July to start the life cycle over again. The second-generation larvae cause the most defoliation.

Fruittree leaf roller (*Archips argyospila*) is becoming a serious defoliator of the birchleaf spirea (*Spiraea betulifolia*), a shrub that is becoming a popular ornamental and a replacement for other spireas. The insect overwinters in the egg stage and hatch in the spring as the leaves are beginning to open. The larvae feed in June and July before forming pupae in the rolled up and webbed leaves at the shoot tips. The adult moth emerges in late summer and lays eggs. The fruittree leaf roller infests a wide range of hosts from ash to willow but has most often been found on birchleaf spirea. While the fruittree leaf roller causes much of this damage in South Dakota, a similar appearing insect, the obliquebanded leaf roller (*Chorisoneura roseaceana*), can also roll the leaves of spirea.

Highlighted Disease Conditions: Foliage Diseases

Apple scab (*Venturia inaequalis*) appeared on the foliage of apple and crabapple trees across the state. This common fungal disease results in infected leaves developing olive-colored, irregularly shaped lesions. The leaves then begin to turn yellow and start to fall prematurely. There are already trees with the first symptoms of the disease appearing; small, circular spots that are a lighter shade than the rest of the leaf. While we see the disease symptoms every year, this year, we saw more of the disease as we had the perfect spring weather for spore germination in eastern South Dakota. These spores germinate very quickly when we have humid, wet weather. The disease overwinters on the fallen, infected leaves and the spores are released from these in the spring. By the time tree owners see the symptoms it's too late for effective treatment the disease as already entered the leaves.

Ash anthracnose (*Plagiostoma fraxini*) symptoms appear on ash throughout the state this year. Anthracnose is a general term to describe diseases that present as leaf curling, cupping or premature falling. These diseases occur on ash, buckeye, maple and oaks and while each are due to a different fungus, the symptoms are similar. They also are common during spring where we experience cool (50 to 70oF), wet weather – a perfect description of this year.

Ash throughout the state were dropping leaves at an alarming rate by early summer. These symptoms were alarming to tree owners as they assumed it to be the work of the emerald ash borer.

Marssonina leaf blight on aspen (Anthony Seidl, SDDA, July 2019)

Marssonina leaf blight (*Marssonina brunnea)* appeared on cottonwood in late August. This disease results in defoliation of cottonwood and other poplars. The disease starts as small leaf spots and lesions on the petioles (the leaf stalk)). The spots are small (1/8-inch across), brownish circular to angular spots with a darker halo. The center may be white.

There are four different species of Marssonina that cause this disease and their symptoms differ slightly – halos are more common with *M. brunnea*, for example – but they all cause defoliation.

The disease overwinters on the infected shoots and in the fallen, infected leaves. Spores are released from these tissues during wet spring weather. If the weather stays wet during the summer, the new foliage will be continuously infected from previously infected leaves and shoots.

Walnut anthracnose (*Ophignomonia leptostyla*). Symptoms include yellowing leaves with brown spots and do not present in our state until about Labor Day. The infected leaflets begin to drop to the ground individually, rather than the complete leaf and every fallen leaflet will have small lesions, from pinhole to pencil size, each with a brown ring around them. The disease is not a major threat to walnuts as the leaves do not yellow until late summer, usually just before they begin to fall. However, the same is not true of the infected fruit. The fruit can also begin to fall prematurely and the ground beneath many walnut trees is covered with fallen leaves and shriveled nuts.

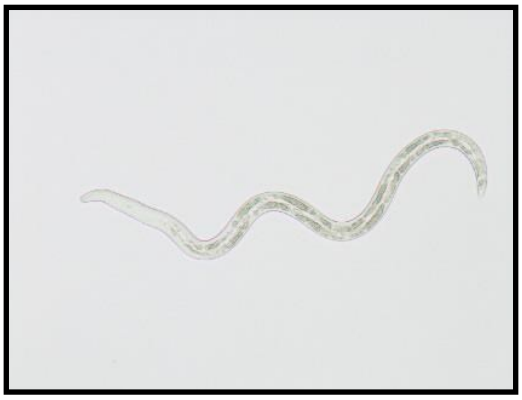
Walnut anthracnose (Dr. John Ball Pest Update, August 28, 2019 Volume 17, #29)

Highlighted Disease Conditions: Wilts

Dutch elm disease (*Ophistoma novi-ulmi*) reports were down this year from previous years. Communities with a significant elm population, more than 10% of their street tree population, are becoming fewer and even in these communities the elms are spread out enough to limit root graft infections. The American elm population continues to decline due to diseases (Dutch elm disease and veticillium wilt), storms, and construction.

While American elm is still one of the most common community trees in the state, comprising of more than 5% of the total street tree population, this is a drop from more than 10% two decades ago. There are some new street plantings of Princeton elm (*Ulmus americana* 'Princeton'), but most of the elms being planted are Accolade (*U*. x 'Morton'), Discovery (*U. davidiana* var. *japonica* 'Discovery') and Triumph (*U*. x 'Morton Glossy').

Pinewood nematode (*Bursaphelenchus xylophilus*) is native to North America and feeds on the living cells surrounding the resin canals in pine sapwood and blue stain fungi that colonizes the same tissue. Pine wilt disease was first noted in Missouri in 1979 and noted in South Dakota during the mid –1980's. In a native host, such as ponderosa pines, the nematode does little injury, but in an exotic pine such as Scotch (*P. sylvestris*) or Austrian (*P. nigra*) pine, it becomes a lethal threat. The nematode and perhaps a bacteria associate, colonizes the vascular system, restricting water transport and causing a wilt disease known as pine wilt. The disease usually kills the tree the same season symptoms appear.



Pinewood nematode
(Dr. John Ball Pest Update,
February 20, 2019 Volume 17, #4)

The occurrence of pine wilt disease is associated with dry and warm summer (a mean July temperature above 70$_{o}$F). If the summers are not warm enough, the disease does not appear despite the presents of the nematode. South Dakota summers have been warmer in the past decade and this has permitted the disease to advance north. It was once restricted to the southern tier of counties, then I-90, then Hwy 14 and now Hwy 212. While we have not confirmed the disease in the northern third of the state, it is likely to be only a matter of time.

Pines usually die the same year that symptoms appear though occasionally death is delayed until the weather warms the following spring. When the dead tree is felled, the stump will have blue stain in the sapwood. Logs from infested trees are very light as the wood has also dried due to the plugging of the vascular system.

The disease is carried by sawyer beetles (*Monochamus*) from an infected tree to a healthy host, usually through the maturation feeding by the newly emerged beetle. The nematode may be transported to drought-stressed pines during oviposition by the beetles as they are attracted to stressed trees.

The management of this disease is prompt removal and disposal of the dead, infested trees. This should be done from autumn through early spring. April 1 is considered the deadline as after that time the longhorned beetles emerge and can carry the nematode to nearby healthy trees. The disease does not move quickly through a group of trees or windbreak. Some trees may carry a small population of nematodes for a year or two before the population expands and the tree presents symptoms. It can take a decade or more before the entire belt dies from the disease.

The disease can be prevented by injections, but the treatments only prevent the disease, they cannot cure an infected tree. The treatments are only about 60 to 80% effective and the effectiveness seem to be lower on the large trees, the ones that most owners want to save.

Forest Health Conditions: Other Damaging Agents

Chlorosis

Chlorosis, a foliage condition where the leaf veins remain green, but the surrounding tissue turns pale green or yellow, was a common occurrence this year due, in part, to the saturated soils. The tree species most often presenting these symptoms were Amur maple (*Acer tataricum* var *ginnala*), red maple (*Acer rubrum*), swamp white oak (*Quercus bicolor*), river birch (*Betula nigra*), and silver maple (*Acer saccharinium*).

The reason for chlorotic leaves is the lack of iron (FE) or manganese (MN) in the foliage. The lack of iron or manganese is not that soils have inadequate amounts of these microelements, but alkaline soils rendering these elements into forms not available to the tree. Any soil with a pH greater than 7.2, and that includes most of the soils in our communities, can result in these trees turning almost a golden yellow by mid-summer. Severely affected leaves can turn completely yellow, fall prematurely and leave the canopy bare by autumn. Some trees may decline and die if these symptoms appear for several years in a row.

Chlorotic swamp white oak
(Dr. John Ball Pest Update, July 25, 2019, Volume 17 #23)

Tornado

Sioux Falls was struck by three tornados on September 12, 2019. The tornados were not on the ground very long, apparently only a minute and each touched down for less than a mile, but wind speeds were above 120 mph. The area with the most damage was either side of I-229, between I-29 and Hwy 115. The northern area of the community escaped the brunt of the winds and damage.

Tornadic wind speeds will often result in trees falling over or shedding branches. Trees are not really designed to withstand these strong, gusty winds so some damage was to be expected. However, trees that are properly pruned have a better chance of surviving high winds with the canopy intact. Many of the damaged trees had codominant stems that split apart under the wind loading. Where these stems connect on a trunk is a weak spot and they frequently snap off at the union. Proper training to a single leader when the tree was young could have avoid much of this damage.

Green ash and silver maple were the two most common trees damaged in the storms. They are also two of the most commonly planted trees in Sioux Falls and are also susceptible to forming codominant leaders. The City had two community brush pile for tree companies and residents to leave brush. These were inspected for signs of emerald ash borer. Since the storm impacted the southern part of the city where this insect has yet to be detected, we did not find any evidence of infested wood.

Decline of limber pines mapping and seed collection

SDDA is continuing to monitor the health of the relic limber pine (*Pinus flexilis*) stands in Custer State Park. The trees are still continuing to decline and while white pine blister rust is a factor, the change in the microenvironment, with the loss of ponderosa pine to mountain pine beetle and white spruce to a wind storm, from cool and moist to hot and dry may also be playing a role.

Plans to inventory all of the limber pines, including seedlings, as well as collecting seed will help maintain the monitoring efforts.

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Annual Insect and Disease Training

The Division of Resource Conservation and Forestry's strategic plan requires one insect and disease training be held each year for division personnel to improve diagnoses of common problems of trees in South Dakota. These training are also open to other agencies and individuals looking to expand their knowledge of tree insects and diseases. The 2019 training was held in Pierre from June 25th—27th. The first day was dedicated to chainsaw safety and proper tree felling techniques. Day two consisted of the identification of common South Dakota trees and pests as well as a UAV drone flight training session. A tree identification and pest quiz was given on day three along with an update on EAB in South Dakota.

Dr. John Ball teaching common South Dakota tree species identification (SDDA, June 26th, 2019)

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